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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/707,422	12/12/2003	Bing Shen	139805	1421

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EXAMINER

HO, ALLEN C

ART UNIT	PAPER NUMBER
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2882

DATE MAILED: 11/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/707,422	SHEN ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5-13,16-21,24-28,30 and 31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5,6,8-13,16-21,26-28,30 and 31 is/are rejected.
- 7) ☒ Claim(s) 7,24 and 25 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claims 2, 13, 21, and 31 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claims 2, 13, 21, and 31 fail to further limit the subject matter of a previous claim.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 12, 13, and 16-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claims 12, 13, and 16-19 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the housing and the means for calculating.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only, if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 27, 28, and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by Gard *et al.* (U. S. Patent No. 5,131,021).

With regard to claims 27 and 31, Gard *et al.* disclosed a method for sensing a focal spot (26), the method comprises: receiving an x-ray beam (22) into an opening (118) of a focal spot sensing device (14), the focal spot sensing device having a sensor device (18); receiving the x-ray beam at the sensor device disposed in the focal spot sensing device, wherein the sensor device includes at least two detector elements (18', 18'') arranged next to each other such that the x-ray beam passing through the opening is allowed to strike more than one of the at least two detector elements, but only a portion of each, the portion being less than 100% of a sensitive area of an associated detector element (column 5, line 60 - column 6, line 33); measuring a change in output signal of each detector element in response to a change in position (35) and size of the area of x-ray (36) allowed to fall on each detector element in response to the movement of the focal spot (column 6, line 34 - column 7, line 66); interpret a position of the x-ray beam (column 7, line 53-66); calculating a position of the focal spot in response to an area of the x-ray beam allowed to fall on the sensor device changing in both position and size at the sensor device in

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response to movement of the focal spot in a plane parallel to the plane of the sensor device; wherein a change in output signal of the sensor device is responsive to a change in position and size of the area of x-ray allowed to fall on the sensor device in response to the movement of the focal spot; and wherein the change in output signal is a position indicator for the focal spot.

With regard to claim 28, Gard *et al.* disclosed the method of claim 27, further comprises calibrating a CT system detector in response to the position of a focal spot (column 8, lines 36-60).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 2, 10-12, 13, 18-20, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gard *et al.* (U. S. Patent No. 5,131,021) in view of Sasaki *et al.* (U. S. Patent No. 6,411,672 B1).

With regard to claims 1 and 2, Gard *et al.* disclosed a focal spot sensing device that comprises: a sensor device (14) that includes at least two detector elements (18', 18'') arranged next to each other, and wherein the at least two detector elements are disposed such that the x-ray beam is allowed to strike more than one of the at least two detector elements, but only on just a portion of each of the at least two detector elements capable of receiving the x-ray beam, the portion being less than 100% of a sensitive area of an associated detector element (column 5, line

60 - column 6, line 33); wherein a change in output signal of each detector element of the sensor device is responsive to a change in position and size of the area of x-ray allowed to fall on each detector element of the sensor device in response to the movement of the focal spot (column 6, line 34 - column 7, line 66); and wherein the change in the output signal is a position indicator for the focal spot.

However, Gard *et al.* failed to disclose that the sensor device is disposed in a housing with an opening.

Sasaki *et al.* disclosed a CT detector (25) disposed in a housing (17). The housing comprises an opening (16) that allows an x-ray beam to enter the housing. Furthermore, the housing comprises temperature-controlling means to make the temperature of the CT detector uniform. Sasaki *et al.* taught that temperature non-uniformity in the detector elements causes artifacts in a CT image (column 1, lines 32-50).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to dispose the sensor device in a housing as disclosed by Sasaki *et al.* First, a person would be motivated to protect the CT detector. Second, a person would be motivated to provide a means to mount the CT detector to the rotating gantry. And third, a person would be motivated to obtain a CT image without artifacts by reducing temperature non-uniformity in the detector elements.

With regard to claims 10 and 11, Gard *et al.* and Sasaki *et al.* disclosed the device of claim 1, further comprises a control mechanism (120).

With regard to claims 12 and 13, Gard *et al.* disclosed a focal spot sensing device that comprises: means (14) for calculating a position of a focal spot, wherein the means for

calculating includes at least two detector elements (18', 18'') arranged next to each other so that an x-ray beam (24) strikes more than one of the at least two detector elements, but only a portion of each, the portion being less than 100% of a sensitive area of an associated detector element (column 5, line 60 - column 6, line 33); wherein a change in output signal of each detector element of the means for calculating is responsive to a change in position and size of the area of x-ray allowed to fall on each detector element of the means for calculating in response to the movement of the focal spot (column 6, line 34 - column 7, line 66); and wherein the change in output signal is a position indicator for the focal spot.

However, Gard *et al.* failed to disclose that the means for calculating is disposed in a housing with an opening.

Sasaki *et al.* disclosed a CT detector (25) disposed in a housing (17). The housing comprises an opening (16) that allows an x-ray beam to enter the housing. Furthermore, the housing comprises temperature-controlling means to make the temperature of the CT detector uniform. Sasaki *et al.* taught that temperature non-uniformity in the detector elements causes artifacts in a CT image (column 1, lines 32-50).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to dispose the means for calculating in a housing as disclosed by Sasaki *et al.* First, a person would be motivated to protect the CT detector. Second, a person would be motivated to provide a means to mount the CT detector to the rotating gantry. And third, a person would be motivated to obtain a CT image without artifacts by reducing temperature non-uniformity in the detector elements.

With regard to claims 18 and 19, Gard *et al.* and Sasaki *et al.* disclosed the device of claim 12, further comprises a control mechanism (120).

With regard to claims 20 and 21, Gard *et al.* disclosed an imaging system that comprises: an x-ray source (10) that produces an x-ray beam (22) and has a focal spot (26); a detector array (14) that receives the x-ray beam and includes a focal spot sensing device (18), the focal spot sensing device includes at least two detector elements (18', 18'') arranged next to each other so that the x-ray beam strikes more than one of the at least two detector elements, but only a portion of each, the portion being less than 100% of a sensitive area of an associated detector element (column 5, line 60 - column 6, line 33); wherein a change in output signal of each detector element of the sensor device is responsive to a change in position and size of the area of x-ray allowed to fall on each detector element of the sensor device in response to the movement of the focal spot (column 6, line 34 - column 7, line 66); and wherein the change in the output signal is a position indicator for the focal spot.

However, Gard *et al.* failed to disclose that the sensor device is disposed in a housing with an opening.

Sasaki *et al.* disclosed a CT detector (25) disposed in a housing (17). The housing comprises an opening (16) that allows an x-ray beam to enter the housing. Furthermore, the housing comprises temperature-controlling means to make the temperature of the CT detector uniform. Sasaki *et al.* taught that temperature non-uniformity in the detector elements causes artifacts in a CT image (column 1, lines 32-50).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to dispose the sensor device in a housing as disclosed by Sasaki *et al.* First,

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a person would be motivated to protect the CT detector. Second, a person would be motivated to provide a means to mount the CT detector to the rotating gantry. And third, a person would be motivated to obtain a CT image without artifacts by reducing temperature non-uniformity in the detector elements.

With regard to claim 26, Gard *et al.* and Sasaki *et al.* disclosed the system of claim 20, further comprises a control mechanism (120).

9. Claims 5, 6, 8, 9, 16, 17, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gard *et al.* (U. S. Patent No. 5,131,021) and Sasaki *et al.* (U. S. Patent No. 6,411,672 B1) as applied to claims 1, 12, and 27 above, and further in view of Warren (U. S. Patent No. 6,362,481 B1).

With regard to claims 5, 6, 8, and 9, Gard *et al.* and Sasaki *et al.* disclosed the device of claim 1. However, Gard *et al.* and Sasaki *et al.* failed to disclose a sensor device that includes a fluorescent screen, which faces the opening, and a position sensitive photodiode that is arranged between the fluorescent screen and a back wall of the housing, wherein the fluorescent screen is optically coupled to the position sensitive photodiode by a transparent epoxy layer.

Warren disclosed a sensor device that includes a fluorescent screen (36) and a position sensitive photodiode (40), wherein the scintillator/fluorescent screen is optically coupled to the position sensitive photodiode by a transparent epoxy layer (46). Warren taught that such an arrangement provides an efficient x-ray detector because the presence of a transparent epoxy layer between the fluorescent screen and the photodiode minimizes optical losses (column 1, lines 28-63). Furthermore, this sensor device will remain operational at high temperature

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because the epoxy layer's CTE is matched to the scintillator/fluorescent screen and the photodiode.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ the sensor device disclosed by Warren in the focal spot sensing device disclosed by Gard *et al.* and Sasaki *et al.*, since a person would be motivated to capture all of the x-rays transmitted through the patient by employing an efficient x-ray detector. Furthermore, a person would be motivated save operating cost by using an x-ray detector that is not susceptible to damage due to thermal stress.

With regard to claims 16 and 17, Gard *et al.* and Sasaki *et al.* disclosed the device of claim 12. However, Gard *et al.* and Sasaki *et al.* failed to disclose a means for calculating includes a fluorescent screen, which faces the opening so that the x-ray beam strikes the fluorescent screen, and a position sensitive photodiode that is arranged between the fluorescent screen and a back wall of the housing, wherein the fluorescent screen is optically coupled to the position sensitive photodiode by a transparent epoxy layer.

Warren disclosed a sensor device that includes a fluorescent screen (36) and a position sensitive photodiode (40), wherein the scintillator/fluorescent screen is optically coupled to the position sensitive photodiode by a transparent epoxy layer (46). Warren taught that such an arrangement provides an efficient x-ray detector because the presence of a transparent epoxy layer between the fluorescent screen and the photodiode minimizes optical losses (column 1, lines 28-63). Furthermore, this sensor device will remain operational at high temperature because the epoxy layer's CTE is matched to the scintillator/fluorescent screen and the photodiode.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ the sensor device disclosed by Warren in the focal spot sensing device disclosed by Gard *et al.* and Sasaki *et al.*, since a person would be motivated to capture all of the x-rays transmitted through the patient by employing an efficient x-ray detector. Furthermore, a person would be motivated save operating cost by using an x-ray detector that is not susceptible to damage due to thermal stress.

With regard to claim 30, Gard *et al.* and Sasaki *et al.* disclosed the method of claim 27. However, Gard *et al.* and Sasaki *et al.* failed to disclose a sensor device that includes a fluorescent screen, which faces the opening, and a position sensitive photodiode that is arranged between the fluorescent screen and a back wall of the focal spot sensing device.

Warren disclosed a sensor device that includes a fluorescent screen (36) and a position sensitive photodiode (40), wherein the scintillator/fluorescent screen is optically coupled to the position sensitive photodiode by a transparent epoxy layer (46). Warren taught that such an arrangement provides an efficient x-ray detector because the presence of a transparent epoxy layer between the fluorescent screen and the photodiode minimizes optical losses (column 1, lines 28-63). Furthermore, this sensor device will remain operational at high temperature because the epoxy layer's CTE is matched to the scintillator/fluorescent screen and the photodiode.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ the sensor device disclosed by Warren in the focal spot sensing device disclosed by Gard *et al.* and Sasaki *et al.*, since a person would be motivated to capture all of the x-rays transmitted through the patient by employing an efficient x-ray detector.

Furthermore, a person would be motivated save operating cost by using an x-ray detector that is not susceptible to damage due to thermal stress.

Allowable Subject Matter

10. Claims 7, 24, and 25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With regard to claims 7, 24, and 25, although the prior art discloses a focal spot sensing device that comprises a housing with an opening, the prior art fails to disclose an opening dimensioned to be approximately a pinhole as claimed.

Response to Arguments

11. Applicant's arguments filed 02 November with respect to the rejection(s) of claim(s) 1, 2, 5-13, 16-21, 24-28, 30, and 31 under 35 U.S.C. 102 or 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Gard *et al.* (U. S. Patent No. 5,131,021).

The examiner agrees with the applicants that Weinberg and Popescu failed to disclose at least two detector elements arranged next to each other, and wherein the opening and the at least two detector elements are disposed such that the x-ray beam is allowed to strike more than one of the at least two detector elements, but only on just a portion of each of the at least two detector elements capable of receiving the x-ray beam, the portion being less than 100% of a sensitive area of an associated detector element.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- (1) Dobbs *et al.* (U. S. Patent No. 5,680,427) disclosed a monitoring detector.
- (2) Hsieh (U. S. Patent No. 5,608,776) disclosed a focal spot sensing device that comprises at least two detector elements (**24A, 24B**) arranged next to each other, and wherein the at least two detector elements are disposed such that the x-ray beam is allowed to strike more than one of the at least two detector elements, but only on just a portion of each of the at least two detector elements capable of receiving the x-ray beam, the portion being less than 100% of a sensitive area of an associated detector element (column 4, lines 47-52).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Allen C. Ho, Ph.D.
Primary Examiner
Art Unit 2882

16 November 2006